

Division of Statistics & Scientific Computation

Annual Report

The University of Texas at Austin

June 2010–May 2011

A Note from the Director

As the Division of Statistics and Scientific Computation (SSC) ends its fourth year and begins its fifth, there is much to celebrate. Some 20 undergraduate and graduate SSC courses are now being regularly offered to students across campus. The graduate *Portfolio in Applied Statistical Modeling* and the undergraduate *Certificate in Scientific Computation* are now thriving enterprises. Statistical and mathematical consulting services are being utilized by faculty and graduate students alike. The Summer Statistics Institute is firmly in place and turning a profit of \$30,000 per year. These academic programs are supplemented each year with a thriving Distinguished Lecture Series, bringing colleagues to campus from across the nation.

Several new initiatives have been launched in the past year. Fall 2010 saw the launch of the peer-tutoring program that employs undergraduates to assist their fellow students in their statistics courses. The new Statistics and Scientific Computation Lab, a collaborative endeavor with the Texas Advanced Computing Center, opened January 2011 in the Flawn Academic Center and was immediately booked to capacity. The Division received one of three \$300,000 Course Transformation Grants awarded on the UT campus. Funding will be used to enhance SSC 302: Data Analysis for the Health Sciences. Efforts are underway, in cooperation with the Texas Advanced Computing Center, to secure funding from the National Science Foundation to enhance research experiences for undergraduates.

Professor Peter Mueller, from M.D. Anderson, was recruited to our faculty in January 2011 and joins Professors Carlos Carvalho, Pradeep Ravikumar, and James Scott as the Division's core faculty. Peter, Carlos, Pradeep, and James are joined by well over 100 associated faculty located in virtually all colleges and schools on campus. Together, these colleagues have developed a proposal to launch a Ph.D. program in Statistics within the next two years. This proposal has been given the green light by campus administration and the Chancellor's Office and is winding its way through the Higher Education Coordinating Board's approval process. We expect our first cohort of Ph.D. students to be admitted in Fall 2012.

I take this opportunity to especially thank Dean Mary Ann Rankin and Provost Steve Leslie for the substantial support they have provided and continue to offer to enhance the Division of Statistics and Scientific Computation programs offered to faculty and students all across the Forty Acres. To repeat, there is much to celebrate.



Dr. Sheldon Ekland-Olson
Director, Division of Statistics & Scientific Computation

THE DIVISION OF STATISTICS & SCIENTIFIC COMPUTATION

The Division of Statistics & Scientific Computation (SSC) is an academic unit housed in the College of Natural Sciences that supports the statistical and scientific computation needs of The University of Texas at Austin (UT) campus. Director Sheldon Eklund-Olson coordinates the participation of 110 associated faculty members across the UT campus. The SSC's organizational chart can be found in Appendix A of this report.

OUR MISSION

The mission of the SSC is to effectively collaborate with other departments to:

- Provide instruction at the graduate and undergraduate level.
- Meet the statistical consulting needs of UT faculty and graduate students.
- Foster and support a campus-wide community of faculty, researchers, and graduate students through lecture series, seminars, workshops, and research opportunities.

OPERATING BUDGET

The SSC budget of \$971,850 is composed of recurring funds committed by the College of Natural Sciences, the College of Liberal Arts, the College of Communications, the McCombs School of Business, the Cockrell School of Engineering, the School of Nursing, the Graduate School, and the Office of the Executive Vice President and Provost.

NEW INITIATIVES IN 2010–11

Ph.D. in Statistics Program

In spring 2011, the SSC began discussion and planning for a Doctor of Philosophy (Ph.D.) in Statistics program with a proposed implementation date of fall 2012. The Ph.D. program in Statistics is a four-year degree that focuses on training future researchers on the theory and methods of statistics. Major emphases are placed on probability models and modern computational statistical tools. Throughout the program, students are exposed to the central ideas of both Bayesian and classical approaches to inference. A hallmark of the program is the integration of substantive areas of application such as government, demography, economics, biology, engineering, computer science, psychology, neuroscience, and education, among others, into the program of work. The proposal has progressed through the approval process and awaits a decision by the Texas Higher Education Coordinating Board.

Peer Tutoring

Beginning fall 2010 semester, the SSC created a new peer-tutoring program for undergraduates in introductory statistics classes. Students needing extra assistance paid for their tutoring services using Bevo Bucks, a cashless form of payment accessible through the student ID Card. Proceeds from the tutoring services were used to pay the peer tutors.

Peer tutors are selected from a talented group of undergraduates who have taken introductory statistics courses and have earned an A in the class. Only students who were highly recommended by their professors were invited to participate as tutors. Peer tutors met regularly with a tutor mentor during the

semester to keep them current on the topics being covered in the classes. In addition to the tutor-mentor meetings, they also participated in the College of Natural Sciences Peer Leader Academy.

Students seeking a peer tutor completed a request for services form and were matched with a peer tutor. The peer tutors worked directly with their tutees to find convenient meeting times and continued to work with their tutees throughout the semester on an as-needed basis.

The program has served over 25 students during its first two semesters and has employed more than 10 peer tutors.

Statistics and Scientific Computation Lab

The SSC partnered with the Texas Advanced Computing Center (TACC) to establish a computer lab on the first floor of the Flawn Academic Center (FAC). The classroom's location in FAC is highly visible in a central campus location. The classroom contains 32 computer workstations in addition to 32 seats at desks that can be configured for lectures or small group work. The computer workstations have several statistical and mathematical applications. SSC, TACC, and Mathematics courses were held in the lab during the spring semester in addition to Physics and Neuroscience lab sections. The SSC also taught Matlab, Mplus, R, and Stata short courses in the lab.

Course Transformation Proposal

The SSC received one of three \$300,000 Course Transformation Proposal (CTP) grants awarded by the Center for Teaching and Learning at The University of Texas at Austin. The CTP program was designed in response to President Powers' call for reinventing higher education and seeks to improve student learning, specifically in high-enrollment, lower division classes.

The three-year grant will support innovative classroom transformations in "SSC 302: Data Analysis for the Health Sciences." These transformations include the integration of a hands-on, data-based laboratory experience for every student; the development of on-line tutorials and problem-solving modules to improve student learning outside of the classroom; the incorporation of undergraduate teaching assistants in the laboratory; team-based learning strategies to boost student motivation and engagement; and an active collaboration with the Open Learning Initiative (OLI) at Carnegie Mellon University to create scaffolded learning experiences that are aligned with the desired learning outcomes for the course. Preliminary survey results from students enrolled in the spring 2011 semester suggest that these transformations have been viewed positively by students and are increasing student motivation, engagement, and achievement of learning outcomes.

Planned Collaboration with Texas Advanced Computing Center

The SSC is preparing a National Science Foundation (NSF) proposal under the Research Experiences for Undergraduates. The proposal calls for the creation of a research site for cohorts of ten students over the course of three years (one cohort for each of three years). Students will participate in the Summer Statistics Institute, the TACC Summer Supercomputing Institute, and work alongside researchers at TACC to develop visualizations of complex data sets using TACC's supercomputing resources. The proposal will be submitted in August of 2011. Funding amount, if awarded, is projected at ~ \$115,000 per year.

ONGOING SSC INITIATIVES

Instruction: Nine undergraduate and eight graduate SSC courses were offered in fall 2010. These courses supported five 20-hour and nine 10-hour TA positions. In spring 2011, the SSC offered ten undergraduate and eight graduate courses. The spring courses supported five 20-hour and eleven 10-hour TA positions.

Graduate Fellows Program: Full-time support was provided to five Graduate Student Fellows in fall 2010 at a total cost of \$29,460. A total of 30 students from 21 different departments applied for one of the graduate fellow positions for data analysis and consulting.

Statistical and Mathematical Consulting Services: Demand for the SSC's consulting services continued to be in high demand in 2010–2011. The SSC provided 975 hours of free consulting and 615 hours of contract consulting to faculty, staff, and students. These services were utilized by nearly all schools and colleges on campus.

Statistical and Mathematical Software: The SSC spent \$15,100 to license statistical and mathematical software for the UT community. Two servers in the College of Natural Sciences were brought online in the summer of 2010 to support this software. Software short courses in Matlab, Mplus, R, SPSS, and SAS continue to have strong demand and typically have waiting lists.

Summer Statistics Institute (SSI): Eighteen faculty members from 11 departments will teach approximately 370 students at the fourth annual SSI in May 2011. The SSI expects to make a profit of approximately \$30,000 this year.

Distinguished Lecture Series: For the fall of 2010, the SSC sponsored a lecture by Dr. Robert E. Kass of Carnegie Mellon University's Center for the Neural Basis of Cognition and Machine Learning. In spring 2011, the SSC sponsored a lecture by Dr. Edward George of the Wharton School of Business, University of Pennsylvania.

Portfolio in Applied Statistical Modeling: Graduate students can elect to complete a Portfolio in Applied Statistical Modeling through the SSC. In May 2011, five students from three different departments presented their research toward completion of the Portfolio. Another 24 students are currently in the program. Of these, five students are expected to earn their Portfolios at the end of the spring 2011 semester.

Portfolio in Scientific Computation: Graduate students can elect to complete a Portfolio in Scientific Computation through the SSC. Currently seven students have been admitted to the program.

Certificate in Scientific Computation: Undergraduates can gain a competitive edge by completing the SSC's 18-hour Certificate in Scientific Computation. There are currently 20 students in the program, and three completed the Certificate requirements in fall 2010 and two more are expected to complete the Certificate in May 2011.

SSC UNIT REPORTS

CONSULTING

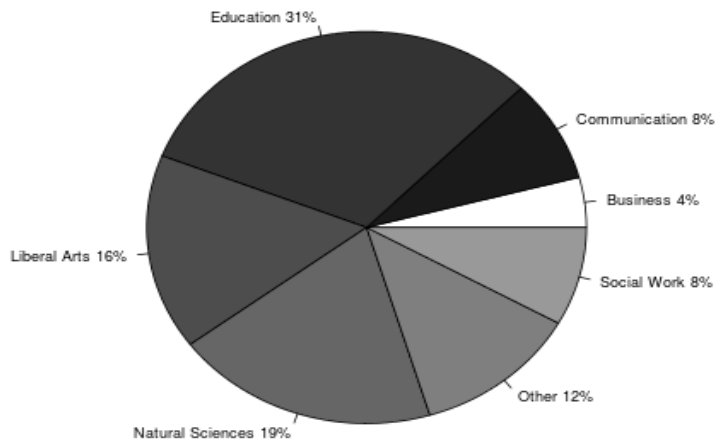
Free Consulting

The SSC provides free statistical and mathematical consulting services to students, faculty, and staff. Consulting clients receive assistance in planning and interpreting analyses, working with statistical software, planning research study designs, and learning how to better organize and manipulate their data. Between June 1, 2010, and May 31, 2011, the SSC provided 975 hours of free consulting to UT faculty, staff, and graduate students, for an average of 18.75 hours per week. Student clients used 86% of these hours, and faculty or staff used 14%. Consulting services were used by colleges and schools across campus: College of Education (31%), the College of Natural Sciences (19%), the College of Communication (9%), the College of Liberal Arts (16%), the School of Social Work (8%), the McCombs School of Business (4%), the Cockrell School of Engineering (2%), the School of Nursing (2%), the College of Pharmacy (2%), and other colleges (2%). Ninety percent of consulting clients reported that their most recent consult was “Very Good” or “Excellent.”

Contract Consulting

The SSC provided 615 hours of contract consulting to UT faculty and organizational units, UT System Institutions, and one state agency in 2010–2011. Contract consulting clients generally have more complex data analysis needs and pay a fee for these services. SSC consultants typically provide a detailed reporting of results suitable for publication. The primary clients seeking contract consulting included faculty from the School of Nursing (24%), the School of Social Work (37%), the College of Education (14%), the UT Library System (7%), the College of Liberal Arts (5%), UT System institutions (5%), the School of Law (3%), the College of Communication (2%), state agencies (2%), the McCombs School of Business (1%), and University Health Services (1%).

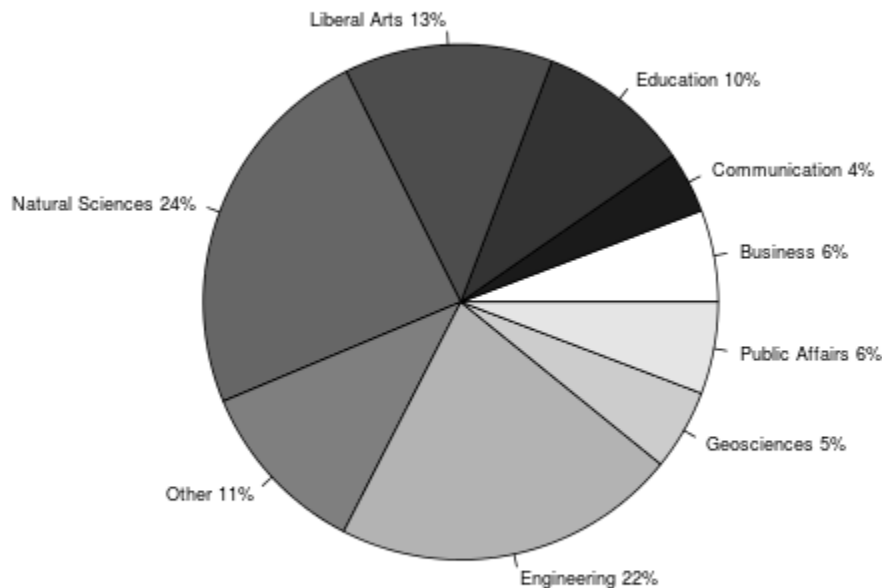
Usage of Free SSC Consulting Services by College



Short Courses

The SSC offers a series of short courses on statistical and mathematical software. We increased the number of courses offered in the past year by hiring former graduate fellows to teach popular introductory courses. Between June 1, 2010, and May 31, 2011, the SSC offered a total of 35 free short courses on the following applications: Matlab, Mplus, R, SAS, SPSS, and Stata. There were 572 attendees in the courses. The colleges and schools with the greatest representation were: the College of Natural Sciences (24%), the Cockrell School of Engineering (22%), the College of Liberal Arts (13%), the College of Education (10%), the Lyndon B. Johnson School of Public Affairs (6%), and the McCombs School of Business (6%). Over 85% of students at short courses rated the course “Good” or “Excellent” on the instructor’s presentation style, ability to answer questions, and responsiveness to student needs.

Free Short Course Participants by College



Graduate Student Consulting Training

In the spring semester 2011, the SSC initiated a graduate student consulting position that was filled by a fall 2010 SSC graduate fellow, Lisa Yarnell. Lisa met weekly with SSC consultants to prepare for her four hours of consulting appointments and to review email questions to which she responded.

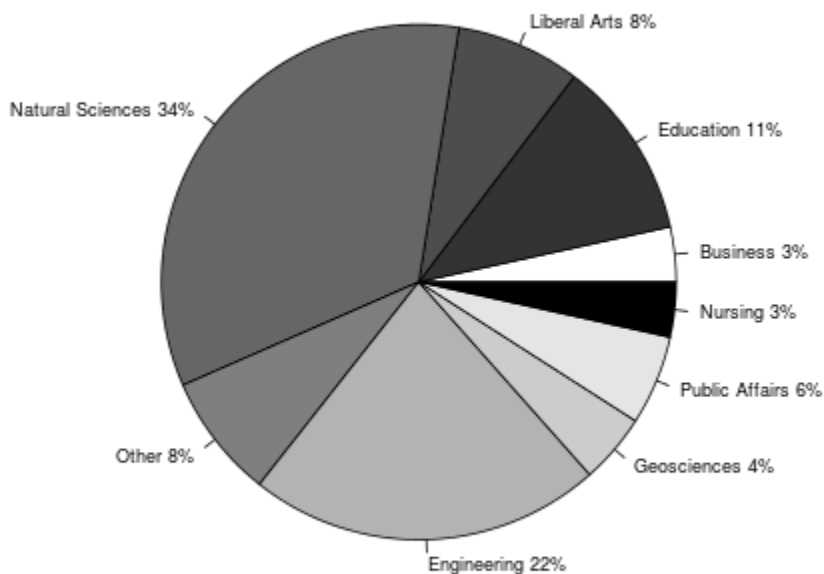
INSTRUCTION

Graduate and Undergraduate courses

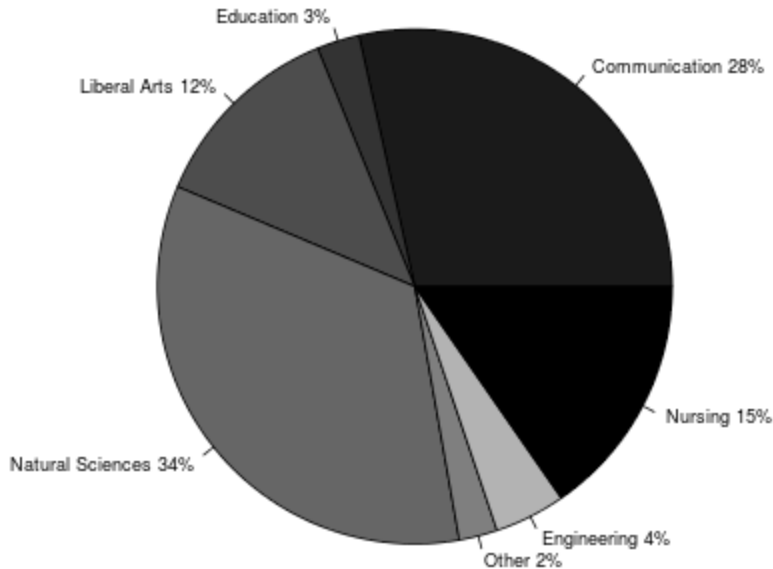
The demand for statistics and scientific computation courses has been growing at a very fast rate. In fall 2010, the SSC offered nine undergraduate and eight graduate courses. In spring 2011, the SSC enrolled 1120 students in ten undergraduate and enrolled 320 students in eight graduate courses.

At the graduate level, the SSC has developed a two-semester “Statistical Methods I” and “Statistical Methods II” sequence. This sequence provides graduate students with a solid foundation in statistics and also serves as the introductory core for the graduate Portfolio in Applied Statistical Modeling. Students may proceed to more advanced applied courses such as “Hierarchical Linear Models” and “Applied Regression,” or delve into statistical theory in “Mathematical Statistics I” and “Mathematical Statistics II.” SSC courses serve students from across campus.

Enrollment in SSC Graduate Courses by College



Enrollment in SSC Undergraduate Courses by College



Master's in Statistics

The Master's in Statistics degree program welcomed its first cohort of eight students in fall 2010 since the SSC took over administration of the program from Mathematics. Approximately 15 students are currently enrolled in the program with an anticipated cohort of 18 students for fall 2011. The program received 73 completed applications, of which 49 applicants were recommended for admission. Four students graduated in fall 2010, and three students are expected to graduate in spring 2011 and two in summer 2011. In addition, several students obtain a M.S. in Statistics while pursuing a Ph.D. in another field such as Biological Sciences, Educational Psychology, Mathematics Education, and Sociology.

The requirements of the M.S. in Statistics program have been updated for the 2011–2013 Graduate catalog. The M.S. in Statistics program requires 33 semester hours and completion of a Master's Report. Degree requirements combine courses in theory and application, and consist of four core courses ("Mathematical Statistics I," "Mathematical Statistics II," "Regression Analysis," and "Design and Analysis of Experiments"), nine to twelve hours of additional major elective statistics courses including one computation course, and nine to twelve hours in a subject area other than statistics.

Statistics in Action

Initially created in the fall of 2009, the Statistics in Action series continued to draw the interest of undergraduate students enrolled in the introductory statistics courses offered by SSC during the fall 2010 and spring 2011 semesters. The series provided an opportunity to expose undergraduate statistics students to how professionals in various fields use data. The Statistics in Action series for both semesters included six participating organizations:

Fall 2010

Austin Energy
GSD&M Idea City
Mindwave Research
NuStats
PPD, Inc.
Seton Family of Hospitals

Spring 2011

Austin Energy
Elected Officials Panel
GSD&M Idea City
PPD, Inc.
Seton Family of Hospitals
Office of the State Demographer

Overall, student interest was greater than expected with waiting lists required for most events. Approximately 100–260 students attended each event with over 1140 students attending in the fall and over 985 students attending in the spring. Students were primarily from the College of Communication, the College of Natural Sciences, the School of Nursing, and the College of Liberal Arts with a total of twelve colleges and schools represented.

GRADUATE FELLOWS PROGRAM

The Graduate Fellows program is a selective semester-long mentorship for UT graduate students that provides considerable training and experience in statistical analysis and consulting on applied problems in a variety of disciplines. Students learn new statistical methods and gain the confidence to teach themselves other methods in the future. The students also come away with the interpersonal skills required of a professional consultant.

Selection for the program is a highly competitive process. For the fall 2010 program, 30 graduate students from 21 different departments applied for five fellows positions. To be eligible, students must have 30 hours of graduate study or a master's degree and have a strong applied statistical background, including use of statistical software.

Fall 2010 Graduate Fellows:

Joey Frazee, Linguistics
Holly Monti, Economics
Harini Venkatesan, Statistics
Dandan Wang, Educational Psychology
Lisa M. Yarnell, Educational Psychology

Data Analysis

Data analysis is a fundamental component of the program. Fellows work with faculty members to provide assistance with the statistical or mathematical analysis of their research data. This allows

students to gain hands-on experience applying statistical methods to real data while providing faculty and researchers across campus a valuable service.

UT Faculty Served through Data Analysis in fall 2010

Larry Abraham, Kinesiology
Lucy Atkinson, Advertising
Lecia Barker, School of Information
Dr. Craig A. Champlin, Communication Sciences & Disorders: Chair
Dr. Clement M. Henry, Government
Mike Mackert, Advertising
Stephanie Rude, Educational Psychology

Consulting Seminar

Graduate fellows are required to enroll in a 3-credit seminar that focuses on developing consulting skills and learning new statistical techniques. Students make presentations, role play, and observe professional staff consultations. During the seminar, students also present their current data analysis project for feedback and review.

CERTIFICATE & PORTFOLIO PROGRAMS

Certificate in Scientific Computation

The Certificate in Scientific Computation is an 18-hour program available to undergraduate students interested in building a strong foundation in computational skills. Since its inception in fall 2009, 33 students have been admitted into the program, 20 students are actively completing the requirements, three students completed the certificate in fall 2010, and two students are expected to complete the certificate during spring 2011. Students come from the following departments: Biology, Biochemistry, Electrical Engineering, Biomedical Engineering, Aerospace Engineering, Civil Engineering, Mathematics, Economics, and Physics.

The program requirements are as follows:

- Multivariate Calculus
- C/C++ and/or Fortran programming
- Linear Algebra, Discrete Mathematics, or Differential Equations
- Two courses in Scientific Computing
- One course in Applied Computing
- Independent Research

The Certificate program is guided by a Steering Committee composed of faculty members from the departments of Biomedical Engineering, Chemistry and Biochemistry, Computer Sciences, Economics, Integrative Biology, Mathematics, Physics, Texas Advanced Computing Center, Aerospace Engineering, and Electrical Engineering. The role of the Steering Committee is to monitor the efficacy of the program, approve changes to the course list, and review student research project ideas.

Portfolio in Applied Statistical Modeling

The Portfolio in Applied Statistical Modeling is a 12- credit program available to graduate students interested in building a solid foundation in statistical skills and applying these skills to their research area. Since its inception in Fall 2009, 29 students have been admitted into the program and five students have completed the portfolio requirements. Five other students, who are expected to complete the Portfolio requirements this semester, presented their research at the Spring 2011 Research Colloquium. Participating students are from the following departments: Curriculum and Instruction, Educational Psychology, Health Education, Psychology, Sociology, Nursing, Computer Sciences, Electrical Engineering, and Public Affairs.

The program requirements are as follows:

- “SSC 380C: Statistical Methods I” or pass a placement exam (prerequisite)
- “SSC 380D: Statistical Methods II”
- Two courses in advanced statistical modeling
- Independent Research
- Presentation of final project at the end-of-semester colloquium

One noteworthy aspect of the Portfolio program is how it brings together students from a wide variety of disciplines through a semi-annual colloquium and the core course, SSC 380D, which offers the students a survey of advanced statistical methods. Enrollment in the introductory courses was high this past fall and this spring so we anticipate a large number of students to apply at the next application deadline 380D.

The Portfolio program is guided by a Steering Committee composed of one faculty member from each college. The role of the Steering Committee is to ensure the efficacy of the program through keeping the list of approved electives up to date, reviewing student research proposals, and updating the application process as necessary.

Portfolio in Scientific Computation

The Portfolio in Scientific Computation is a 12-credit program available to graduate students interested in applying scientific computation tools to their research. Since its inception in fall 2010, seven students have been admitted to the program and interest is growing. Students come from the following departments: Computational Linguistics, Petroleum and Geosystems Engineering, Physics, Ecology, Evolution and Behavior, and Operational Research and Industrial Design.

The portfolio requirements are as follows:

- “SSC 292: Intro to Scientific Programming” (Students who are already competent in C and FORTRAN may opt to take an additional elective in place of this course. Differential and Integral Calculus (e.g. M 408C) is a prerequisite for this course.)
- “SSC 394: Scientific/Technical Computing” (Multivariable Calculus (e.g. M 408D) is a prerequisite for this course.)

- One elective from list of approved courses
- Independent Research
- Presentation of final project at the end-of-semester colloquium

The Portfolio is guided by a Steering Committee composed of members from associated SSC faculty. The role of the Steering Committee is to ensure the efficacy of the program through keeping the list of approved electives up to date, reviewing student research proposals, and updating the application process as necessary.

UT SUMMER STATISTICS INSTITUTE

Summer Statistics Institute 2011

The 2011 Summer Statistics Institute (SSI) will be held May 23–26 in collaboration with the College of Liberal Arts. The Institute will feature 17 classes designed to appeal to a broad range of students. The full list of courses and instructors can be found below.

Course	Instructor Name	Instructor Department
Introduction to Statistics	D. Robinson/N. Stroud	Educational Psychology/Communication
Statistical Foundations	J. Bryant	Biological Sciences
Questionnaire Design Analysis	M. Musick	Sociology
Introduction to R	Samuel Scarpino,	Ecology, Evolution and Behavior
Data Analysis using SAS	M. Hersh	SSC
Introduction to SPSS	Lindsay Chilek	SSC
Introduction to Regression	M. Mahometa	SSC
Advanced Regression	C. Carvalho	Information, Risk and Operations Mgmt
Bayesian Statistics for Social Sciences	S. Jessee	Government
Common Mistakes in Using Statistics	M. Smith	Mathematics
Comp. Analysis of Social Networks	I. Dhillon	Computer Science
Hierarchical Linear Modeling	K. Pituch	Educational Psychology
Hierarchical Linear Modeling	T. Beretvas	Educational Psychology
Power Analysis for Proposal Writing	N. Marti	SSC
Introduction to GIS	J. Miller	Geography and the Environment
Structural Equation Modeling	T. Whittaker	Educational Psychology
Time Series Modeling	T. Sager	Information, Risk and Operations Mgmt

APPENDIX A: ORGANIZATIONAL CHART FOR THE DIVISION OF STATISTICS & SCIENTIFIC COMPUTING (as of May 2011)

